CLAIMS

1. An optical device comprising:

(a) a first active medium having a first input port and a first output port arranged to define a first propagation path for traversal of a first optical signal in a first forward direction between the first input port and the first output port;

(b) a second active medium having a second input port and a second output port arranged to define a second propagation path for traversal of a second optical signal in a second forward direction between the second input port and second output port; and

(c) a feedback path connecting the first and second active media so as to route at least a portion of the first and second optical signals from the first and second output ports to the second and first output ports as respective second and first optical control signals for travel along the second and first propagation paths in second and first reverse directions that are opposite to the second and first forward directions respectively.

2. An optical device according to claim 1, wherein the first and second output ports face in the same direction.

3. An optical device according to claim 1, wherein the first and second active media are arranged with their first and second forward directions aligned.

4. An optical device according to claim 1, wherein the feedback path comprises a bend.

5. An optical device according to claim 1, wherein the first and second active media are arranged with their first and second forward directions opposed.

6. An optical device according to claim 1, wherein the first and second output ports face towards each other.

7. An optical device according to claim 1, wherein the feedback path is substantially straight.

8. An optical device according to claim 1, wherein the feedback path is a waveguide shared by the first and second optical control signals which propagate along the waveguide in opposite directions.

9. An optical device according to claim 1, comprising a first optical isolator arranged to filter out the first optical control signals after traversal of the first active medium in the first reverse direction.

10. An optical device according to claim 1, comprising a second optical isolator arranged to filter out the second optical control signal after traversal of the second active medium in the second reverse direction.

11. An optical device according to claim 1, comprising at least one multi-way optical element arranged in the feedback path so as to route a part of at least one of the first and second optical signals from the first and second output ports out of the feedback path for output from the device.

12. An optical device according to claim 1, wherein the first and second active media and the feedback path are integrated in a planar waveguide structure.

13. An optical device according to claim 1, wherein the first and second active media are discrete components and the feedback path comprises an optical fiber waveguide.

14. An optical device according to claim 1, wherein the first and second active media are gain media.

15. An optical device according to claim 1, wherein the first and second active media are lossy media.

16. An optical device according to claim 1, comprising a reflector arranged to reflect the second optical control signal back through the second active medium as the second optical signal.

17. A method of modulating an optical signal, comprising:

(a) providing first and second active media;

(b) supplying first and second optical signals to traverse the first and second active media in first and second forward directions; and

(c) routing at least a portion of the first and second optical signals, after traversing the first and second active media, to the second and first active media as second and first optical control signals respectively, wherein the first and second optical control signals are supplied through the first and second active media in first and second reverse directions opposed to the first and second forward directions so that the first and second optical control signals vary the modulation experienced by the first and second optical signals during their respective traverses of the first and second active media.

18. A method according to claim 17, wherein the second optical signal is substantially invariant, serving as a reference signal, and the method provides a threshold determination.

19. A method according to claim 17, wherein the first and second optical signals are variable, and the method provides a comparison function.

20. A method according to claim 17, wherein the first and second active media are gain media so that the first and second optical control signals vary the gain experienced by the first and second optical signals.

21. A method according to claim 17, wherein the first and second active media are lossy media so that the first and second optical control signals vary the attenuation experienced by the first and second optical signals.